



MEETING AGENDA
BMP Retrofit Pilot Program Quarterly Status Meeting No. 16

DATE: July 10, 2002 Wednesday
TIME: 10:00 a.m. to 3:00 p.m.
PLACE: RBF, 14725 Alton Pkwy, Irvine, CA 92619 phone: (949) 472-3505
ATTENDEES: Distribution
COPIES TO: File: JN 34123, 34218
SUBJECT: Quarterly 16

AGENDA ITEMS

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| 1. Introductions and Objectives of the Meeting | 10:00-10:30 |
| 2. CDS Update | 10:30-11:00 |
| 3. Other BMP Updates (StormFilter Performance, Austin Sand Filter Maintenance) | 11:00-11:15 |
| 4. Final Report Discussion (including lunch) | 11:15-3:00 |

Distribution:

Dave Beckman, NRDC

Chris May, NRDC

Rich Horner, NRDC

Steve Fleischli, SM Baykeepers

Bruce Reznik, SD Baykeepers

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Anna Lantin, RBF

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**Qualification Statement for the Stormwater Management StormFilter
for the Caltrans Kearny Mesa Maintenance Facility**

San Diego, CA

July 3, 2002

Prepared by

**Stormwater Management, Inc.
Portland, OR**

Qualification Statement for the Stormwater Management StormFilter for the Caltrans Kearny Mesa Maintenance Facility

Site visit and observations

On June 14 observations were made of the site. All three of the vaults were opened and inspected. The visit also included observations of the sampling points and pretreatment vaults. Of particular interest were the levels of multiple high water marks in order to estimate the total number of storms that the system had surcharged. The points below provide qualitative observations:

- High Water marks



There are a series of high water marks evidenced by small pieces of flotsam attached to the vault walls. The high water marks are significantly above levels the filters are designed to handle. Based on the observations it appears that two storm events may have caused this condition. There are about 8 high water marks in the vaults but multiple marks can be caused during the course of a single storm event. In fact, inflow hydrographs clearly indicate intermittent inflows causing multiple peaks during a single storm event.

It is surmised that two separate storm events caused the mark from the content of the high water marks. The highest marks were comprised of small bit of wood debris and leaf matter. The visual appearance of all but two of the high water marks have the same debris content and characteristic, hence it presumed this was caused during the course of a single storm. The maximum height of the water surface elevation indicates about 12" of head

on the overflow which means the system was overflowing at about 1 CFS. As expected, moving from the downstream overflow point to the upstream vault, the WSE increased in a manner consistent with the head loss characteristics of the vault connections and appurtenances.

The second storm that super elevated the WSE is evidenced by distinct lines where plant pollen (probably originating from the adjacent trees) adhered to the sides of the vault. This event super elevated the first vault only since the high mark for the "pollen storm" did not reach the invert of the pipe that connects the middle and downstream vault

- Sediment Loads



Sediment deposits on the floors and outer surfaces of the cartridges were also observed. The upstream vault had an estimated 1" of a highly organic sediment on the floor of the vault. Close observation of this sediment revealed leaf imprints leading to the conclusion that it was composed mostly of decayed eucalyptus leaves. The media inside the cartridges was very dark with a high degree of occlusion. Clearly the first vault is past due for maintenance.

The middle downstream vault had moderate loading of mostly sediment. The characteristic of the sediment in all the vaults was that sandy sediments were in the upstream vaults moving to a fine silty characteristic in the downstream vault.

- Condition of filter media

The tops of the cartridges were removed in all three of the vaults. Within each vault the cartridges appeared to be uniformly and equally loaded with solids. However the cartridges in the upstream vault were clearly more heavily loaded than those in the downstream vault. This is primarily due loading from smaller storms only being in the upstream vault(s) and that the upstream vault acts as a pretreatment to the downstream vault(s). The photo to the left shows a



top view of a cartridge in the upstream vault with the hood removed. The media (normally white) is heavily loaded with solids from the runoff. The media in the downstream vaults was less loaded and was more of a light brown, probably because there were significantly less organics (from the leaves) in the two downstream vaults.

- Water in Floats

During the inspection it was noted that a series of the internal floats contained varying degrees of water. Careful

inspection of the floats revealed that the spin weld plug at the top of the floats were not installed correctly and hence would take on water. It is not known how quickly this happens but the presence of water in the float will change the buoyancy characteristics and cause the float not to operate correctly. Given this situation coupled with the hydraulic control at the end of pipe, it is likely that the cartridges with operating floats were subject to much higher hydraulic loading. As an estimate about 40% of the floats observed had this problem.

Technological improvements since the StormFilter installation

Since the installation of the StormFilter system at Kearny Mesa, Stormwater Management has made significant technological improvements to the system to enhance performance and add more flexibility to meet design objectives. Listed below are a series of improvement made since the facility installation in December, 1998.

Individual cartridge flow control

The Kearny Mesa facility utilizes up to five cartridges plumbed in parallel into an under drain pipe. Located at the outlet of the under drain pipe is a flow control orifice such that when operating in unison, each cartridge is operating at a design flow rate of 15 gpm. This design approach however is problematic in that, the flow potential of an individual cartridge is about 30 gpm when fresh. As the cartridges in the design do not all activate at the same time some of the cartridges will operate in excess of design parameters and decrease performance.

Subsequent research at SMI indicated that at the time of start up and shut down (mostly shut down) that significant pulses of TSS we generated due to a pressure wave which propagated from the under drain to the media. Systems with multiple cartridges on one line would “percolate like a coffee pot” because the pressure wave of on cartridge shutting down would cause another to pop up. This would continue until the system dampened the transient and rested the system

The design of the StormFilter was modified by placing a calibrated orifice disc at the base of each cartridge. The presence of the individual orifice allows each cartridge to operate independently of the others. Hence the maximum flow is maintained at the design or less. The added benefit of the disc is that it acts to provide a damper to transient waves virtually eliminating the pulse of TSS originating from the media. The discs can now be used to regulate the individual cartridge flow from 5 to 15 gpm each. This change was implemented in 1999.

Drop weir box

The StormFilter is design to operate up to a depth of 21” above floor the cartridges set upon. In vaults placed in series, once the capacity of the first vault is reached, excess flow is then routed to the second filter via a connection pipe. Earlier designs required that head build on the invert of the connection pipe to convey flow from one vault to the next. This is problematic in that the head required would surcharge the filters which increased flow above the design value. To remedy this, SMI now designs the vault interconnection with a drop weir with the invert set to 21”. The length of the weir is 50”. Once over the weir the interconnection pipe is at a lower elevation and easily passes the excess flow without adding excessive head to the upstream vault. For example a bypass flow of 1 CFS causes only 2” of additional head.

Also, due to compounding head loss, SMI no longer design systems greater than two vaults in series. The interconnection pipes were set 25 inches above the floor, current design set the elevation at 21” above the floor. During the big storm the system was surcharged to a depth of 36.5 inches above the upstream vault floor.

Centertube screen

The flow characteristic of the cartridge is in a radial fashion. Water flows from the outside of the filter to the inside. The filter cartridges contain an outer screen which retains media, a layer or multiple layers of filter media, an inner screen to retain the filter media, and a perforated center tube which collects the flow and allows for the discharge to the under drain system. The current configuration of the Kearny Mesa cartridges uses a fine screen which can restrict the flow as the filter accumulates sediments. A more recent configuration use a coarser screen with a “tuff pad” backing that eliminates inner screen clogging.

The Kearny Mesa facility also has an older style of the center tube. The current design uses an injection molded tube which includes larger opening sizes with horizontal and vertical channels to promote uniform flow characteristics.

Quality control and manufacturing process

As SMI has developed the product, it has also improved quality control and manufacturing process through the increase use of automated systems and quality control checks during the manufacturing process. Of particular note is QC processes to insure a well sealed spin weld. The system at Kearny Mesa was one of the first systems to have the rotomolded float.

As a policy, during routine maintenance when filter systems contain a cartridge with outdated or defective parts, the system is automatically updated at no additional cost to the customer.

Scrubbing regulators

The most recent improvement to the StormFilter is the addition of scrubbing regulators to the cartridge hood. There are a series of small slots that are designed to promote the equalization the self cleaning mechanism around the entire circumference of the filter and to optimize the use of the energy to maximize the removal of surface sediment while not disturbing the structure of the media. Observations of the hoods with the scrubbing regulators indicated that a sudden release of energy could scour the filter media, hence disturbing the deposited TSS within the media matrix and again cause a pulse of TSS on the discharge line.

Factors that may have impacted measured performance

- **Flow control of the cartridges**

Flows through a cartridge in excess of design flow through a cartridge will decrease its performance. It is likely that due to the end of pipe flow control and periodic surcharging of the filters, performance was impacted. The higher flow

rates will also amplify the transient which tend to cause pulsing of TSS on start up and shut down.

- **Leaf Load**

The floor of the upstream vault is coved with about 1.5” of a fine organic layer of composted eucalyptus leaves. This is evidenced by the large number of eucalyptus trees around the maintenance facility and careful observation of the black organic layer reveals leaf imprints.

The leaf load enters the filter and is not measured as TSS because they are floatable. However, once in the vault the leaves disintegrate into fine particles that could to some degree be suspended and elevate TSS at the outlet. The result would be to cause an apparent decrease in performance because the incoming mass is not accounted for. Observations of the filter media in the first vault clearly show high level of dark sediment within the media pores. It is likely that this is organic particulates from the leaves as this level of loading was observed in the first vault only.

- **Reduction of CEC impacting soluble metals removal.**

Data from this study and others indicate that after the first year of operation the CEC declines as the sites become saturated with heavy metals. It is likely that after one year period the exchange sites on the Kearny Mesa filters were at or near saturation. This is evidenced by the trend of decline in soluble metals removal from one storm to the next. However, toward the end of the sampling period there appears to be an increase in soluble metals removal. It is possible that this was caused by the deposition of composted leaf matter within the media macropores which added more exchange sites toward the end of the monitoring period.

- **Overflow and sampling of commingled flows**

Based on the observations it appears that the system was in overflow on a single event. Based on preliminary reports it is most likely that event 11 (April 7, 2001) caused the overflow. The recorded peak flow into the facility was 2.1 CFS. This event also had a negative TSS removal indicating, most likely, re-suspension of the organic layer in the upstream vault.

Conclusions and Recommendations

Based on site observations and review of the preliminary reports it was concluded that:

- With older design parameters, individual filters were operating at a flow rate in excess of design, and pulsed sediment on start up and shut down, thus reducing removal efficiencies.

- Accumulation of leaves in the first vault resulted in periodic re-suspension of organics and elevated TSS on the effluent.

The following recommendations are made:

- Full maintenance with upgrade to current technology

Due to the degree of sediment loading and presumed saturation of the CEC, a full system maintenance is recommended. At the time of maintenance, the entire system will be upgraded to the current technology consistent with SMI policy.

- Capture of leaves with frequent removal

The heavy leaf load incident to the filters could be intercepted with screens and cleaned out on an as needed basis. This reduction would improve the performance of the system and reduce maintenance costs. This can be accomplished by installing some netting similar that to manufactured by Enviropod or other catch basin insert manufacturers.

- Reporting of TSS

Due to the likelihood of overflow and commingled flows during storm 11, perform a separate TSS and TP removal efficiency in which storm 11 is excluded. This is in addition to including the storm into a final TSS and TP calculation.

- Use of ZPG media

Specify a media mix consisting of perlite on the outer surface and a blend of 10% GAC and 90% zeolite by volume.

DOCUMENTS DISTRIBUTED FOR STATUS 16 MEETING

Additional documents distributed for the Status 16 quarterly meeting included:

A Three-Year Assessment of Vector Production in Structural Best Management Practices in Southern California, June 2002; see Appendix E, Vector Monitoring and Abatement.

and

Fourth Year 2001/2002 Report, Continuous Deflective Separation Units, Operations, Maintenance, and Monitoring, CTSW-RT-02-037, July 2002 see Appendix F, Water Quality Monitoring Summary.